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U.S. Army Aviation Epidemiology Data Register: Descriptive Analysis of Medical Disqualifications Among Female Army Aviator Training Applicants

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By

Kevin T. Mason

Aircrew Protection Division

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Reviewed:

Kevin T. Mason

KEVIN T. MASON
LTC, MC, MFS
Director, Aircrew Protection
Division

Released for publication:

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Congress has directed studies of women in the military. The frequency and causes of medical disqualification for female applicants to Army aviator training are unknown. The U.S. Army Aviation Epidemiology Data Register was queried to provide a descriptive analysis of a cohort of female applicants to Army aviator training for calendar years 1987 to 1990.

There was a total of 774 female Class 1 and Class 1A applicants to U.S. Army aviator training during calendar years 1987 to 1990. Among the applicants, 41.2 percent were Class 1 (Warrant officer candidates) and 58.8 percent were Class 1A (Commissioned officers). Commissioned officer applicants were significantly younger than Warrant officer applicants ($p<0.001$, 2-sided, Kolmogorov-Smirnov statistic). Among Class 1 applicants, 38.9 percent were medically disqualified compared to 36.7 percent for Class 1A. There was no difference in the risk for medical disqualification between Class 1 and 1A (Relative risk=1.059, $CI_{95\%}=0.882,1.272$).

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The six most prevalent disqualifying diagnoses were a failure to meet anthropometric standards (16.8 percent of applicants), myopia (9.3 percent), allergic rhinitis (4.1 percent), failure to meet weight standards (1.3 percent), anemia (1.3 percent), and hyperopia (1.2 percent). There was no significant difference in the risk for disqualification for any category of diagnosis between Class 1 and Class 1A.

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Table of contents

Page

List of tables 1

List of figures 2

Background
- Military relevance 3
- Classes of flying duty medical examination for aviator training applicants 3
- Literature review 3
- U.S. Army Aviation Epidemiology Data Register 4

Method 4

Results 4

Discussion 7

Summary and conclusions 7

References 9

Appendix A. Data tables 10

List of tables

Table

1. Number of female aviator training applicants for calendar years 1987 to 1990 5

2. Number of medical disqualifications stratified by class of FDME 6

3. Cause for medical disqualification stratified by category of diagnosis and class of FDME . . . 6

A-1. Number of female aviator applicants stratified by age and class of FDME 10

A-2. Cause for medical disqualification stratified by diagnosis and class of FDME 11

List of figures

Figure

1. Age distribution of female aviator training applicants stratified by class of FDME 5

Background

Military relevance

Congress directed studies related to women in the military. A family of databases, collectively named the U.S. Army Aviation Epidemiology Data Register (AEDR), contains information concerning the health of female applicants to Army aviator training and female Army aviators. The U.S. Army Aeromedical Research Laboratory (USAARL) is using the AEDR to study the health of female Army aircrew. Currently, the frequency and causes of medical disqualification for female applicants to U.S. Army aviator training are unknown. This paper provides a descriptive analysis of a cohort of women applying to Army aviator training for calendar years 1987 to 1990.

Classes of flying duty medical examination for aviator training applicants

Class 1 applicants are warrant officer candidates. They come from the enlisted ranks of all U.S. military services or directly from civilian acquisition programs. Class 1A applicants are commissioned officers or cadets. They come from the Reserve Officer Training Corps (ROTC) or U.S. military academies. Most Class 1A applicants apply to Army aviator training in the beginning of their senior year of military academy, college, or university education.

Literature review

The Canadian Forces reported their experiences with the medical selection of female applicants to aviator training for calendar years 1977 to 1988. Among a total of 477 applicants, the medical disqualification rate was 31.2 percent. Failure to meet anthropometric standards (40.9 percent of disqualifications), vision standards (36.9 percent), neurologic standards (10.7 percent), and orthopedic standards (8.1 percent) accounted for a majority of the medical disqualifications. The article did not provide the frequency of medical disqualification by diagnosis, but lumped disqualifications into broad categories, such as "pulmonary" (Hicks, 1990).

The Belgian Armed Forces reported their experiences with the medical selection of female applicants to aviator training for the period 1 January 1983 to 31 July 1989. The medical disqualification rate was 93.2 percent among a total of 74 flight training applicants. Failure to meet neuropsychiatric standards (42.0 percent of disqualifications), vision standards (33.3 percent), and anthropometric standards (20.3 percent) accounted for a majority of medical disqualifications. The article listed the medical disqualifications by diagnosis. Unsatisfactory psychometric testing was the cause of medical disqualification in 25 of 29 cases of failure to meet neuropsychiatric standards. Refractive error accounted for 20 of the 23 ophthalmologic disqualifications. Inadequate leg length was the only cause for failure to meet anthropometric standards (Vancutsem and Vandenbosch, 1990).

U.S. Army Aviation Epidemiology Data Register

Data were obtained from the U.S. Army Aviation Epidemiology Data Register. The AEDR is a family of databases storing medical history and physical parameters of U.S. Army student and trained aviators. One component is a flying duty medical examination (FDME) database. All U.S. Army flight training applicants and trained aviators are required to submit a FDME upon application, and then annually within 90 days of the end of their next birth month (Department of the Army, 1995). Another component is the waiver and suspension file (WSF), a mortality and morbidity index of flight physical disqualifications, casualty reports, and aeromedical board outcomes. The WSF references a medical document archive, containing the details of WSF cases.

Method

The AEDR was queried to identify all female Class 1 and Class 1A applicants to U.S. Army aviator training for the period 1 January 1987 to 31 December 1990, a total of 4 calendar years. Since some women had multiple Class 1 and Class 1A flying duty medical examinations (FDMEs) during the period of observation, the last Class 1 or 1A FDME was used for this analysis. The subject's age and class of FDME were extracted from the AEDR FDME database. The final medical disposition of the FDME and cause of medical disqualification were extracted from the WSF.

Goodness-of-fit testing by the Kolmogorov-Smirnov statistic was used for the analysis of cumulative frequency distributions (Daniel, 1983). The method of Katz was used for the analysis of relative risk with 95 percent confidence intervals (Kahn and Sempos, 1989). In some cases, an applicant had multiple disqualifications, such as a failure to meet both the anthropometric standards and vision standards. The percent disqualified was defined as:

$$\textit{Percent disqualified} = 100\left(\frac{\textit{Number with the disqualifying diagnosis or in the diagnosis category}}{\textit{Number of applicants in the FDME Class}}\right)$$

Results

Table 1 shows the number of applicants stratified by class of FDME and the calendar year of their last Class 1 and Class 1A FDME. There was a total of 774 applicants during the study period. There was an average of 193 applicants per year. Among the applicants, 58.8 percent were Class 1A and 41.2 percent were Class 1.

Table 1.

Number of female aviator training applicants for calendar years 1987 to 1990.

Class of FDME	Calendar year				N	Percent
	1987	1988	1989	1990		
Class 1A	102	114	126	113	455	58.8
Class 1	92	70	89	68	319	41.2
N	194	184	215	181	774	

Figure 1 shows the age distribution of female aviator training applicants stratified by class of FDME. The mean age of Class 1A applicants was 23.3, and the mean age of Class 1 applicants was 24.7. Class 1A applicants were significantly younger than Class 1 applicants ($p<0.001$, 2-sided, Kolmogorov-Smirnov statistic). Table A-1, Appendix A, shows the number and cumulative frequency distribution by age and class of FDME for Figure 1.

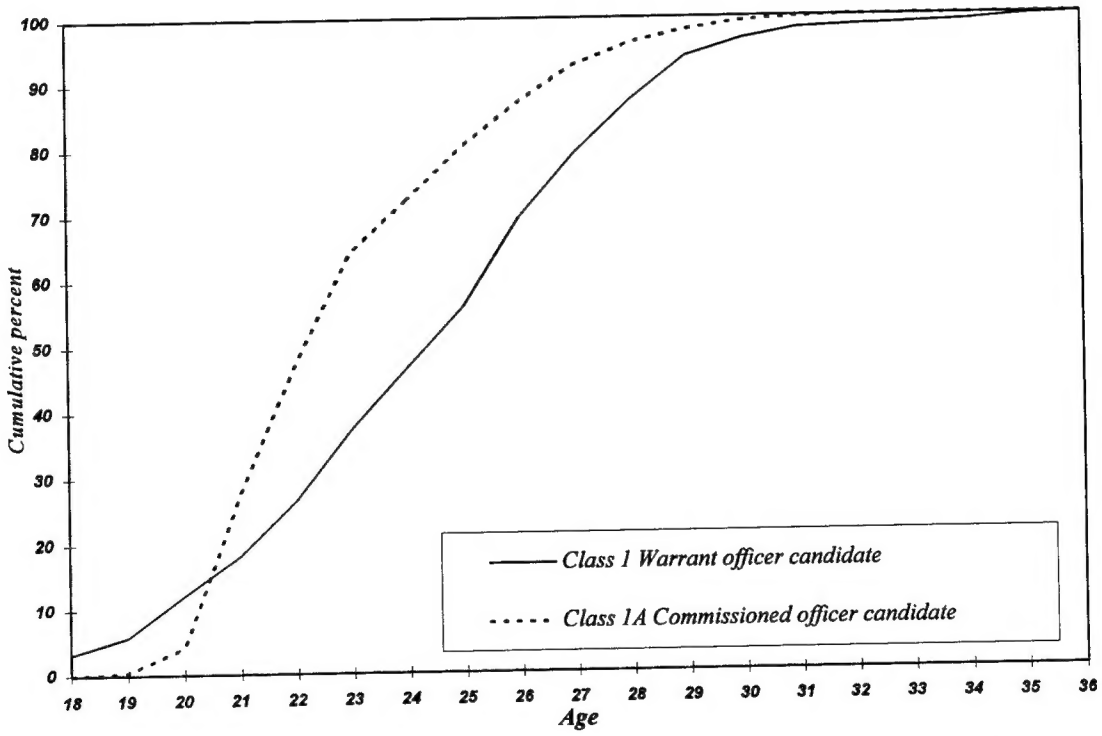

Figure 1. Age distribution of female aviator training applicants stratified by class of FDME.

Table 2 shows the number of medically disqualified female aviator training applicants stratified by class of FDME. Among Class 1 applicants, 38.9 percent were medically disqualified compared to 36.7 percent for Class 1A. There was no difference in the risk for medical disqualification between Class 1 and Class 1A (Relative risk=1.059, $CI_{0.95}$=0.882,1.272).

Table 2.
Number of medical disqualifications stratified by class of FDME.

Class of FDME	Medically disqualified	Qualified	N	Percent disqualified
Class 1A	167	288	455	36.7
Class 1	124	195	319	38.9
N	291	483	774	

Table 3.
Cause for medical disqualification stratified by category of diagnosis and class of FDME.

Category of diagnosis	Class 1A disqualified	Percent disqualified	Class 1 disqualified	Percent disqualified	Both classes	Percent disqualified
Anthropometry	73	16.04	57	17.87	130	16.80
Ophthalmology	52	11.43	35	10.97	87	11.24
Allergy	15	3.30	18	5.64	33	4.26
Orthopedics	11	2.42	7	2.19	18	2.33
Neurology	7	1.54	9	2.82	16	2.07
Cardiology	10	2.20	4	1.25	14	1.81
Otolaryngology	8	1.76	5	1.57	13	1.68
Psychiatry	8	1.76	5	1.57	13	1.68
Endocrinology	7	1.54	5	1.57	12	1.55
Hematology	4	0.88	6	1.88	10	1.29
Genitourinary	5	1.10	4	1.25	9	1.16
Pulmonary	0	0.00	2	0.63	2	0.26
N disqualified	200		157		357	

Table 3 shows the cause for medical disqualification stratified by category of diagnosis and class of FDME. There was no significant difference in the risk for disqualification for any category of diagnosis between Class 1 and Class 1A by calculating the relative risk with 95 percent confidence intervals (not shown). Table A-2 shows the cause for disqualification stratified by specific medical diagnoses and class of FDME.

The six most prevalent disqualifying diagnoses included a failure to meet anthropometric standards (16.8 percent of applicants), myopia (9.3 percent), allergic rhinitis (4.1 percent), failure to meet weight standards (1.3 percent), anemia (1.3 percent), and hyperopia (1.2 percent).

Discussion

When comparing our population of female applicants to other cohorts, the method of examination and medical standards affect the comparison. In this study, we have data to compare our population to the Canadian Forces and the Belgian Armed Forces, but the methods of examination are not the same. For example, the U.S. Army aviator training applicant FDME does not include routinely psychometric testing. This testing is performed on all applicants in the Belgian Armed Forces. Failure to meet psychometric standards was the most common cause of medical disqualification in the Belgian Armed Forces, while none of our subjects were disqualified for abnormal psychometrics. What you do not look for, you are not likely to find.

One factor confounding this analysis is that U.S. military flight surgeons do not report all discovered medical disqualifications for aviator training applicants. Many applicants who suspect they are disqualified come to military flight surgeon offices for a screening examination directed at the cause of disqualification. For example, an applicant knows or suspects that they are color vision deficient. The local flight surgeon might examine the applicant's color vision and finds a significant color vision deficiency. The applicant might not pursue the application process further after learning they are disqualified. Some flight surgeons do not send incomplete, disqualified Class 1 and 1A FDMEs to the reviewing authorities for these quick visits by applicants; despite being required to do so by regulation (Department of the Army, 1995). The aviation medicine clinic contact with the applicant might be even more casual, such as the applicant asking a medic to "check me out."

Summary and conclusions

There was a total of 774 female Class 1 and Class 1A applicants to U.S. Army aviator training during calendar years 1987 to 1990. Among the applicants, 41.2 percent were Class 1 (warrant officer candidates) and 58.8 percent were Class 1A (commissioned officers). commissioned officer applicants were significantly younger than warrant officer applicants ($p<0.001$, 2-sided, Kolmogorov-Smirnov statistic). Among Class 1 applicants, 38.9 percent were medically disqualified compared to 36.7 percent for Class 1A. There was no difference in the risk for medical disqualification between Class 1 and 1A (Relative risk=1.059, $CI_{0.95}$=0.882,1.272).

The six most prevalent disqualifying diagnoses were a failure to meet anthropometric standards (16.8 percent of applicants), myopia (9.3 percent), allergic rhinitis (4.1 percent), failure to meet weight standards (1.3 percent), anemia (1.3 percent), and hyperopia (1.2 percent). There was no significant difference in the risk for disqualification for any category of diagnosis between Class 1 and Class 1A.

Further studies are required to determine if there are gender-specific differences for the risk of medical disqualification among applicants. It is likely female applicants are at higher risk for a failure to meet anthropometric standards than men. The distribution of anthropometric measurements among female applicants and male applicants has not been analyzed.

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Appendix A.
Data tables.

Table A-1.
Number of female aviator applicants stratified by age and class of FDME.

Age	Class 1A	Class 1	N	Cumulative percent Class 1A	Cumulative percent Class 1
18	0	10	10	0.00	3.19
19	2	8	10	0.44	5.75
20	17	20	37	4.19	12.14
21	106	19	125	27.59	18.21
22	89	26	115	47.24	26.52
23	77	34	111	64.24	37.38
24	36	29	65	72.19	46.65
25	37	29	66	80.35	55.91
26	30	42	72	86.98	69.33
27	26	31	57	92.72	79.23
28	15	25	40	96.03	87.22
29	9	21	30	98.01	93.93
30	6	8	14	99.34	96.49
31	2	5	7	99.78	98.08
32	1	1	2	100.00	98.40
33	0	1	1	100.00	98.72
34	0	1	1	100.00	99.04
35	0	2	2	100.00	99.68
36	0	1	1	100.00	100.00
N	453	313	766		
Age unknown	2	6	8	Birth date missing	
N	455	319	774		

Table A-2.

Cause for medical disqualification stratified by diagnosis and class of FDME.

Category	Class FDME		N	Disqualifying medical diagnosis	Class FDME		N
	1A	1			1A	1	
Allergy	15	18	33	Allergic rhinitis	15	17	32
				Anaphylaxis - bee sting	0	1	1
Anthropometrics	73	57	130	Leg length only	2	1	3
				Total arm span only	60	40	100
				Total arm span and leg length	11	16	27
Cardiology	10	4	14	Hypertension	1	1	2
				Left axis deviation	2	0	2
				Mitral valve prolapse	2	0	2
				Short PR interval	3	3	6
				Supraventricular tachycardia	1	0	1
				Wolff-Parkinson-White syndrome	1	0	1
Endocrinology	7	5	12	Hypothyroidism	0	2	2
				Overweight	7	3	10
Genitourinary	5	4	9	Cervical dysplasia	3	1	4
				Dysmenorrhea	1	0	1
				Endometriosis	1	1	2
				Renal calculus	0	2	2
Hematology	4	6	10	Anemia	4	6	10
Neurology	7	9	16	Chronic headaches	1	1	2
				Concussion	0	1	1
				Migraine headaches	0	3	3
				Motion sickness	1	1	2
				Post concussion syndrome	0	1	1
				Seizure disorder	1	1	2
				Skull fracture	1	0	1
				Syncope, recurrent	3	1	4

Table A-2 (Continued).
Cause for medical disqualification stratified by diagnosis and class of FDME.

Category	Class FDME		N	Disqualifying medical diagnosis	Class FDME		N
	1A	1			1A	1	
Ophthalmology	52	35	87	Depth perception deficit	0	1	1
				Hyperopia	4	5	9
				Myopia	44	28	72
				Ocular motility disorder	3	1	4
				Retinal detachment	1	0	1
Orthopedics	11	7	18	Arthropathy, multiple joints	0	1	1
				Arthropathy of shoulder	1	0	1
				Arthropathy of wrist	1	0	1
				Chondromalacia	0	1	1
				Chronic low back pain	1	0	1
				Compression fracture of spine	0	1	1
				Derangement of knee	4	0	4
				Pes planus	0	1	1
				Scoliosis	4	3	7
Otolaryngology	8	5	13	Hearing loss	6	1	7
				Nasal polyps	0	1	1
				Sinusitis	2	3	5
Psychiatry	8	5	13	Adjustment disorder	1	0	1
				Depression	3	3	6
				Dissociative reaction	1	0	1
				Psychosomatic disorder	1	0	1
				Sleepwalking	1	0	1
				Unsatisfactory ARMA	1	2	3
Pulmonary	0	2	2	Asthma	0	2	2
N	200	157	357	N	200	157	357

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Department of Human Factors
ISSM, USC
Los Angeles, CA 90089-0021

U.S. Army White Sands
Missile Range
ATTN: STEWS-IM-ST
White Sands Missile Range, NM 88002

Director, Airworthiness Qualification Test
Directorate (ATTC)
ATTN: STEAT-AQ-O-TR (Tech Lib)
75 North Flightline Road
Edwards Air Force Base, CA 93523-6100

Ms. Sandra G. Hart
Ames Research Center
MS 262-3
Moffett Field, CA 94035

Commander
USAMRMC
ATTN: SGRD-UMZ
Fort Detrick, Frederick, MD 21702-5009

Commander
U.S. Army Health Services Command
ATTN: HSOP-SO
Fort Sam Houston, TX 78234-6000

U. S. Army Research Institute
Aviation R&D Activity
ATTN: PERI-IR
Fort Rucker, AL 36362

Commander
U.S. Army Safety Center
Fort Rucker, AL 36362

U.S. Army Aircraft Development
Test Activity
ATTN: STEBG-MP-P
Cairns Army Air Field
Fort Rucker, AL 36362

Commander
USAMRMC
ATTN: SGRD-PLC (COL R. Gifford)
Fort Detrick, Frederick, MD 21702

TRADOC Aviation LO
Unit 21551, Box A-209-A
APO AE 09777

Netherlands Army Liaison Office
Building 602
Fort Rucker, AL 36362

British Army Liaison Office
Building 602
Fort Rucker, AL 36362

Italian Army Liaison Office
Building 602
Fort Rucker, AL 36362

Directorate of Training Development
Building 502
Fort Rucker, AL 36362

Chief
USAHEL/USAAVNC Field Office
P. O. Box 716
Fort Rucker, AL 36362-5349

Commander, U.S. Army Aviation Center
and Fort Rucker
ATTN: ATZQ-CG
Fort Rucker, AL 36362

Dr. Sehchang Hah
Dept. of Behavior Sciences and
Leadership, Building 601, Room 281
U. S. Military Academy
West Point, NY 10996-1784

Canadian Army Liaison Office
Building 602
Fort Rucker, AL 36362

German Army Liaison Office
Building 602
Fort Rucker, AL 36362

French Army Liaison Office
USAAVNC (Building 602)
Fort Rucker, AL 36362-5021

Australian Army Liaison Office
Building 602
Fort Rucker, AL 36362

Dr. Garrison Rapmund
6 Burning Tree Court
Bethesda, MD 20817

Commandant, Royal Air Force
Institute of Aviation Medicine
Farnborough, Hampshire GU14 6SZ UK

Defense Technical Information
Cameron Station, Building 5
Alexandra, VA 22304-6145

Commander, U.S. Army Foreign Science
and Technology Center
AIFRTA (Davis)
220 7th Street, NE
Charlottesville, VA 22901-5396

Commander
Applied Technology Laboratory
USARTL-ATCOM
ATTN: Library, Building 401
Fort Eustis, VA 23604

Commander, U.S. Air Force
Development Test Center
101 West D Avenue, Suite 117
Eglin Air Force Base, FL 32542-5495

Aviation Medicine Clinic
TMC #22, SAAF
Fort Bragg, NC 28305

Dr. H. Dix Christensen
Bio-Medical Science Building, Room 753
Post Office Box 26901
Oklahoma City, OK 73190

Commander, U.S. Army Missile
Command
Redstone Scientific Information Center
ATTN: AMSMI-RD-CS-R
/ILL Documents
Redstone Arsenal, AL 35898

Aerospace Medicine Team
HQ ACC/SGST3
162 Dodd Boulevard, Suite 100
Langley Air Force Base,
VA 23665-1995

U.S. Army Research and Technology
Laboratories (AVSCOM)
Propulsion Laboratory MS 302-2
NASA Lewis Research Center
Cleveland, OH 44135

Commander
USAMRMC
ATTN: SGRD-ZC (COL John F. Glenn)
Fort Detrick, Frederick, MD 21702-5012

Dr. Eugene S. Channing
166 Baughman's Lane
Frederick, MD 21702-4083

U.S. Army Medical Department
and School
USAMRDALC Liaison
ATTN: HSMC-FR
Fort Sam Houston, TX 78234

NVESD
AMSEL-RD-NV-ASID-PST
(Attn: Trang Bui)
10221 Burbeck Road
Fort Belvior, VA 22060-5806

CA Av Med
HQ DAAC
Middle Wallop
Stockbridge, Hants S020 8DY UK

Dr. Christine Schlichting
Behavioral Sciences Department
Box 900, NAVUBASE NLON
Groton, CT 06349-5900

Commander
Aviation Applied Technology Directorate
ATTN: AMSAT-R-TV
Fort Eustis, VA 23604-5577

COL Yehezkel G. Caine, MD
Surgeon General, Israel Air Force
Aeromedical Center Library
P. O. Box 02166 I.D.F.
Israel

HQ ACC/DOHP
205 Dodd Boulevard, Suite 101
Langley Air Force Base,
VA 23665-2789

41st Rescue Squadron
41st RQS/SG
940 Range Road
Patrick Air Force Base,
FL 32925-5001

48th Rescue Squadron
48th RQS/SG
801 Dezonia Road
Holloman Air Force Base,
NM 88330-7715

HQ, AFOMA
ATTN: SGPA (Aerospace Medicine)
Bolling Air Force Base,
Washington, DC 20332-6128

ARNG Readiness Center
ATTN: NGB-AVN-OP
Arlington Hall Station
111 South George Mason Drive
Arlington, VA 22204-1382

35th Fighter Wing
35th FW/SG
PSC 1013
APO AE 09725-2055

66th Rescue Squadron
66th RQS/SG
4345 Tyndall Avenue
Nellis Air Force Base, NV 89191-6076

71st Rescue Squadron
71st RQS/SG
1139 Redstone Road
Patrick Air Force Base,
FL 32925-5000

Director
Aviation Research, Development
and Engineering Center
ATTN: AMSAT-R-Z
4300 Goodfellow Boulevard
St. Louis, MO 63120-1798

Commander
USAMRMC
ATTN: SGRD-ZB (COL C. Fred Tyner)
Fort Detrick, Frederick, MD 21702-5012

Commandant
U.S. Army Command and General Staff
College
ATTN: ATZL-SWS-L
Fort Levenworth, KS 66027-6900

ARNG Readiness Center
ATTN: NGB-AVN-OP
Arlington Hall Station
111 South George Mason Drive
Arlington, VA 22204-1382

Director
Army Personnel Research Establishment
Farnborough, Hants GU14 6SZ UK

Dr. A. Kornfield
895 Head Street
San Francisco, CA 94132-2813

ARNG Readiness Center
AATN: NGB-AVN-OP
Arlington Hall Station
111 South George Mason Drive
Arlington, VA 22204-1382

Mr. George T. Singley, III
Depupty Assistant Secretary of the Army
for Research and Technology
and Chief Scientist
ATTN: Room 3E374
103 Army Pentagon
Washington, DC 20310-0103

The Honorable Gilbert F. Decker
Assistant Secretary of the Army
for Research, Development,
and Acquisition
ATTN: Room 2E672
103 Army Pentagon
Washington, DC 20310-0103

Dr. Craig Dorman
Office of the Deputy Director,
Defense Research and Engineering
ATTN: Room 3D129LM
103 Army Pentagon
Washington, DC 20310-0103

HQ, AFOMA
ATTN; SGPA (Aerospace Medicine)
Bolling Air Force Base,
Washington, DC 20332-6188

Cdr, PERSCOM
ATTN: TAPC-PLA
200 Stovall Street, Rm 3N25
Alexandria, VA 22332-0413